

Claims

- [c1] 1. A method for processing annotated images comprising the following steps:
removing one or more annotations from a grayscale annotated image to derive a first modified image;
processing said first modified image using an algorithm to derive a processed image; and
merging the removed one or more annotations with said processed image to derive a merged image.
- [c2] 2. The method as recited in claim 1, wherein said removing step comprises the following: deriving a first binary mask defining one or more image regions; and multiplying said first binary mask and said annotated image to derive said first modified image.
- [c3] 3. The method as recited in claim 2, wherein said merging step comprises the following: inverting said first binary mask to derive a second binary mask defining one or more annotation regions; multiplying said second binary mask and said annotated image to derive a second modified image; and merging said second modified image and said processed image to derive said merged image.
- [c4] 4. The method as recited in claim 1, wherein the merged annotations occupy the same pixels in said merged image that the removed annotations originally occupied in said annotated image.
- [c5] 5. The method as recited in claim 1, wherein said removing step comprises morphology-based processing and thresholding.
- [c6] 6. The method as recited in claim 1, wherein said removing step comprises the following: grayscale erosion of said annotated image using a structuring element to derive an eroded image; thresholding said eroded image to derive a first binary mask; dilation of said first binary mask using said structuring element to derive a second binary mask defining one or more image regions; and multiplying said second binary mask and said annotated image to derive said first modified image.
- [c7] 7. The method as recited in claim 6, wherein said merging step comprises the

following: inverting said second binary mask to derive a third binary mask defining an annotation region; multiplying said third binary mask and said annotated image to derive a second modified image; and merging said second modified image and said processed image to derive said merged image.

- [c8] 8. The method as recited in claim 1, wherein said removing step comprises thresholding and pixel connectivity-based analysis.
- [c9] 9. The method as recited in claim 1, wherein said removing step comprises the following: thresholding the annotated image to derive a first binary mask; using 8-connected analysis to reject segments smaller than a prespecified size from said first binary mask to derive a second binary mask defining one or more image regions; and multiplying said second binary mask and said annotated image to derive said first modified image.
- [c10] 10. The method as recited in claim 9, wherein said merging step comprises the following: inverting said second binary mask to derive a third binary mask defining an annotation region; multiplying said third binary mask and said annotated image to derive a second modified image; and merging said second modified image and said processed image to derive said merged image.
- [c11] 11. The method as recited in claim 1, wherein said removing step comprises the following: thresholding the annotated image to derive a first binary mask; using 8-connected analysis to reject segments smaller than a prespecified size from said first binary mask to derive a second binary mask defining one or more image regions; removing holes from said second binary mask to derive a third binary mask; and multiplying said third binary mask and said annotated image to derive said first modified image.
- [c12] 12. The method as recited in claim 1, wherein said processing step comprises filtering to enhance said first modified image.
- [c13] 13. A computer system programmed to perform the following steps:
removing one or more annotations from a grayscale annotated image to derive a first modified image;
processing said first modified image using an algorithm to derive a processed

image; and

merging the removed one or more annotations with said processed image to derive a merged image.

[c14] 14. The system as recited in claim 13, wherein said removing step comprises the following: deriving a first binary mask defining one or more image regions; and multiplying said first binary mask and said annotated image to derive said first modified image.

[c15] 15. The system as recited in claim 14, wherein said merging step comprises the following: inverting said first binary mask to derive a second binary mask defining one or more annotation regions; multiplying said second binary mask and said annotated image to derive a second modified image; and merging said second modified image and said processed image to derive said merged image.

[c16] 16. The system as recited in claim 13, wherein said removing step comprises the following: grayscale erosion of said annotated image using a structuring element to derive an eroded image; thresholding said eroded image to derive a first binary mask; dilation of said first binary mask using said structuring element to derive a second binary mask defining one or more image regions; and multiplying said second binary mask and said annotated image to derive said first modified image.

[c17] 17. The system as recited in claim 16, wherein said merging step comprises the following: inverting said second binary mask to derive a third binary mask defining an annotation region; multiplying said third binary mask and said annotated image to derive a second modified image; and merging said second modified image and said processed image to derive said merged image.

[c18] 18. The system as recited in claim 13, wherein said removing step comprises the following: thresholding the annotated image to derive a first binary mask; using 8-connected analysis to reject segments smaller than a prespecified size from said first binary mask to derive a second binary mask defining one or more image regions; and multiplying said second binary mask and said annotated image to derive said first modified image.

- [c19] 19. The system as recited in claim 18, wherein said merging step comprises the following: inverting said second binary mask to derive a third binary mask defining an annotation region; multiplying said third binary mask and said annotated image to derive a second modified image; and merging said second modified image and said processed image to derive said merged image.
- [c20] 20. The system as recited in claim 13, wherein said removing step comprises the following: thresholding the annotated image to derive a first binary mask; using 8-connected analysis to reject segments smaller than a prespecified size from said first binary mask to derive a second binary mask defining one or more image regions; removing holes from said second binary mask to derive a third binary mask; and multiplying said third binary mask and said annotated image to derive said first modified image.
- [c21] 21. The system as recited in claim 13, wherein said processing step comprises filtering to enhance said first modified image.
- [c22] 22. A method for processing annotated images comprising the following steps: removing the hue and saturation components from a HSV color annotated image to derive a brightness component annotated image; removing one or more annotations from the brightness component annotated image to derive a first modified image; processing said first modified image using an algorithm to derive a processed image; and merging the removed one or more annotations and the removed hue and saturation components with said processed image to derive a merged image.
- [c23] 23. The method as recited in claim 22, wherein said removing step comprises the following: deriving a first binary mask defining one or more image regions; and multiplying said first binary mask and said annotated image to derive said first modified image.
- [c24] 24. The method as recited in claim 23, wherein said merging step comprises the following: inverting said first binary mask to derive a second binary mask defining one or more annotation regions; multiplying said second binary mask

and said annotated image to derive a second modified image; and merging said second modified image and said processed image with said removed hue and saturation components to derive said merged image.

- [c25] 25. The method as recited in claim 22, further comprising the step of converting an RGB color annotated image from RGB color space to HSV color space to derive said HSV color annotated image.
- [c26] 26. A computer system programmed to perform the following steps:
removing the hue and saturation components from an HSV color annotated image to derive a brightness component annotated image;
removing one or more annotations from said brightness component annotated image to derive a first modified image;
processing said first modified image using an algorithm to derive a processed image; and
merging the removed one or more annotations and the removed hue and saturation components with said processed image to derive a merged image.
- [c27] 27. The system as recited in claim 26, wherein said removing step comprises the following: deriving a first binary mask defining one or more image regions; and multiplying said first binary mask and said annotated image to derive said first modified image.
- [c28] 28. The system as recited in claim 27, wherein said merging step comprises the following: inverting said first binary mask to derive a second binary mask defining one or more annotation regions; multiplying said second binary mask and said annotated image to derive a second modified image; and merging said second modified image and said processed image with said removed hue and saturation components to derive said merged image.
- [c29] 29. The system as recited in claim 26, further programmed to perform the step of converting an RGB color annotated image from RGB color space to HSV color space to derive said HSV color annotated image.
- [c30] 30. A computerized image enhancement system programmed to perform the following steps:

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